

[PRESS RELEASE]

Belgian researchers create “treasure map” to find meteorites in Antarctica: A new era for meteorite missions begins

A Belgian-Dutch scientific team, including researchers from the Université libre de Bruxelles, has created the first ever “treasure map” revealing where meteorites can be found in Antarctica. Meteorites come from space and are found on the Earth’s surface as stony material. They contain crucial information about the formation and evolution of our solar system.

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Veronica Tollenaar, PhD student at Université libre de Bruxelles and lead author of the study, added: *“We found several never-visited meteorite-rich areas relatively close to research stations. In addition, by using new detection techniques in the field, such as drones, we are at the beginning of a new era for Antarctic meteorite missions.”*

Meteorites in Antarctica

When meteorites fall on the Antarctic ice sheet, they usually become embedded in the ice. They are transported to the sea by the flow of the ice, except when there are mountains, sometimes hidden under the ice. These mountains push the meteorites to the surface of the ice sheet in what are known as blue ice regions.

Until now, only parts of the Antarctic blue ice regions have been searched for meteorites, with varying degrees of success. Researchers have now combined different types of observations in a machine-learning algorithm, enabling them to identify zones where meteorites are most likely to be found. The results of the study were published in the renowned scientific journal *Science Advances*.

“Through our analyses, we learned that satellite observations of temperature, ice flow rate, surface area and geometry are good predictors of the location of meteorite-rich areas,” says **Veronica Tollenaar, Glaciology Laboratory, Faculté des Sciences, Université libre de Bruxelles**.

The machine-learning algorithm superimposes the various satellite observations and detects interactions between these images, which is essential for predicting the presence of meteorites. Véronica Tollenaar: “Antarctica is very remote and many areas have never been visited before. Moreover, reports on the success of previous meteorite missions are often unclear and lack detail. To get around this problem, we relied on ‘positive and unlabelled learning’, an emerging field in machine learning. This means that the search algorithm is programmed to include observations of places where meteorites have been found before (positive) as well as places where we don’t know if there are any meteorites (unlabelled). The algorithm keeps its eye open for the unknown, as it were.”

A treasure map with 80% accuracy

The accuracy of the algorithm to find meteorite-rich areas is estimated at more than 80%, based on independent data that was not used in the development of the algorithm. The resulting “treasure map” is accessible on the website *Where to Catch a Falling Star*, where anyone can search the Antarctic continent and explore locations where many meteorites can be found.

According to Harry Zekollari, a postdoctoral scientist at ETH Zurich, who supervised the study: “The human factor plays a major role in today’s meteorite expeditions. These missions require huge logistical and financial investments, and we believe that our new map will increase the success of future missions.”

Tollenaar, V., Zekollari, H., Lhermitte, S., Tax, D., Debaille, V., Goderis, S., Claeys, P., Pattyn, F. (2022), Unexplored Antarctic meteorite collection sites revealed through machine learning, *Science Advances*

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The study is part of the BICEPS project (Antarctic blue ice as a porthole to the Solar System and Earth’s changing climate), funded by the Fonds de la Recherche Scientifique (FNRS, PhD grant awarded to Veronica Tollenaar). Scientists from Université libre de Bruxelles (Belgium), Delft University of Technology (Netherlands) and Vrije Universiteit Brussel (Belgium) contributed to this study.

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The press kit contains 10 images and 1 video: <https://vtollenaar.stackstorage.com/s/EIHn3Zbg4z7NDMhI> - Antarctic meteorite “treasure map”: <https://wheretocatchafallingstar.science/>